HBM 5/24

IN REPLY REFER TO

1790
145

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
District Office
P.O. Box 1269
Montrose, Colorado 81401

BUREAU OF LAND MANAGEMENT
1973 MAY 24 PM 12:05

May 23, 1973

Memorandum

To: State Director, Colorado

From: District Manager, Montrose

Subject: Supplemental to Final Environmental Statement for Crystal Dam

The environmental statement was filed with the Council on Environmental Quality April 20, 1973 just 15 days before the bids were to be opened. This does not allow much time for review. The supplement was received May 4 with comments asked to be returned by June 1, 1973 fifteen days after the contract was awarded.

Page 2, 1st full paragraph: Removing gravel from the downstream channel certainly doesn't seem to be in keeping with environmental quality. Neither does the more than 1 mile of channelization below the dam.

2nd paragraph: Says that much of the disturbance to the canyon wall is eliminated by moving the power plant. Why can't it all be eliminated or why shouldn't it.

3rd paragraph: Where will the waste from the tunnel be deposited? The volume of rock from a 500 foot tunnel would be significant.

Page 4. Geology: If this area is subject to land slides, may not the lake cause more, which could fill the lake?

Page 5. 3rd. paragraph states that "much of their effort was concentrated in the Blue Mesa area with examinations in the Crystal Reservoir area limited by its accessibility." This is a poor excuse for not studying the vegetation.

Dr. Ferchau of Western State College says that the vegetation section is completely inadequate and says there are some unique flora in the canyon.

Page 6, item 5. It looks like this summer is a little late for an archeological survey of the reservoir area since the contractor is ready to start work now.

Page 6, C. 1. Maybe channelization is necessary but it sure is against all natural laws and will most certainly destroy the fisheries in several miles of stream which has been excellent fishing in the past. Very vague terms are used as in the first paragraph it states "The alignment of the channel has been established so as to preserve <u>most</u> of the natural conditions of right bank of the river canyon".

Pages 6 and 7, 2. Spillway operation. The tests run below Morrow Point would not be the same as the effect of spillway operation and we do not believe they should be considered conclusive. This certainly is serious in Oregon and could well become another problem to the fisheries below the dam.

The Bureau of Reclamations answer to the "Critique of Final Environmental Statement of Crystal Dam Development" seem to be more of a justification statement than facts. I feel that Dr. Ferchau has some good points that were not answered.

Marlyn V. Jones

CRYS
.73
SUP

United States Department of the Interior

BUREAU OF RECLAMATION
WASHINGTON, D.C. 20240

Dest. w/encl.
only to:

IN REPLY REFER TO: 207
120.1

MAY 7 1973

220

Memorandum

To: Director, Bureau of Sport Fisheries and Wildlife
Director, Bureau of Mines
Director, Bureau of Land Management
Director, Geological Survey
Director, National Park Service
Director, Bureau of Outdoor Recreation

elm
5/9

From: ACTING Commissioner of Reclamation

Subject: Supplement to Final Environmental Statement for Crystal Dam, Reservoir, and Powerplant, Curecanti Unit, Colorado River Storage Project

Enclosed for your information is a copy of a supplement to the final environmental statement for the Crystal Dam, Reservoir, and Powerplant, Curecanti Unit, Colorado River Storage Project. The final statement for this work was filed with the Council on Environmental Quality on December 6, 1971.

(SGD) G. G. STARR

Enclosure

DEPARTMENT OF THE INTERIOR
(INT FES 73-21)

SUPPLEMENT TO THE FINAL
ENVIRONMENTAL STATEMENT

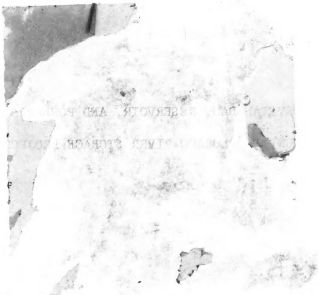
CRYSTAL DAM, RESERVOIR, AND POWERPLANT

CURECANTI UNIT, COLORADO RIVER STORAGE PROJECT, COLORADO

Prepared by
Bureau of Reclamation
Department of the Interior

G G Stamm
Acting Commissioner

APR 30 1973



SUMMARY

(X) Supplement to Final Environmental Statement

Department of the Interior, Bureau of Reclamation, Upper Colorado Region

1. Type of Action (X) Administrative ( ) Legislative

2. Brief Description of Action Final environmental statement (INT-FES 71-21) for the Crystal Dam, Reservoir, and Powerplant was filed with CEQ on December 6, 1971. This supplement covers design changes and results of investigations which have occurred since that time. The Crystal damsite is situated on the Gunnison River, 15 miles east of Montrose, Colorado, in Montrose County.

3. Summary of Environmental Impacts and Adverse Environmental Effects

   a. Channelizing of the stream below the damsite has been reduced from a length of 8,000 feet to 5,800 feet, lessening the impact on the fishery.

   b. Esthetic impact minimized by eliminating some overhead power lines, placing part of the crest access road in tunnel, and moving the powerplant from the abutment toward the center of the dam.

   c. Turbidity increases during construction to be controlled through water treatment facilities and equipment.

   d. Inundation of an additional 11 acres of canyon, including about 1,000 feet of river channel, by raising the reservoir normal water surface 5 feet.

4. Alternatives Considered

   a. Construction of a dam 5 feet lower in height as proposed in final environmental statement.

   b. Raising channel grade 5 feet above that proposed in final environmental statement, thereby maintaining same power head.

   c. Keeping channel same as proposed in final environmental statement and adding 5 feet to power head.

5. List of Entities who Received Copy of Final Environmental Statement

   See attached list.

6. Date Made Available to CEQ and the Public

   a. Draft Statement: August 20, 1971
   b. Final statement: December 6, 1971
   c. Supplement to final statement: APR 30 1973

DISTRIBUTION LIST FOR
SUPPLEMENT TO FINAL ENVIRONMENTAL STATEMENT
CRYSTAL DAM, RESERVOIR, AND POWERPLANT
CURECANTI UNIT - COLORADO RIVER STORAGE PROJECT - COLORADO

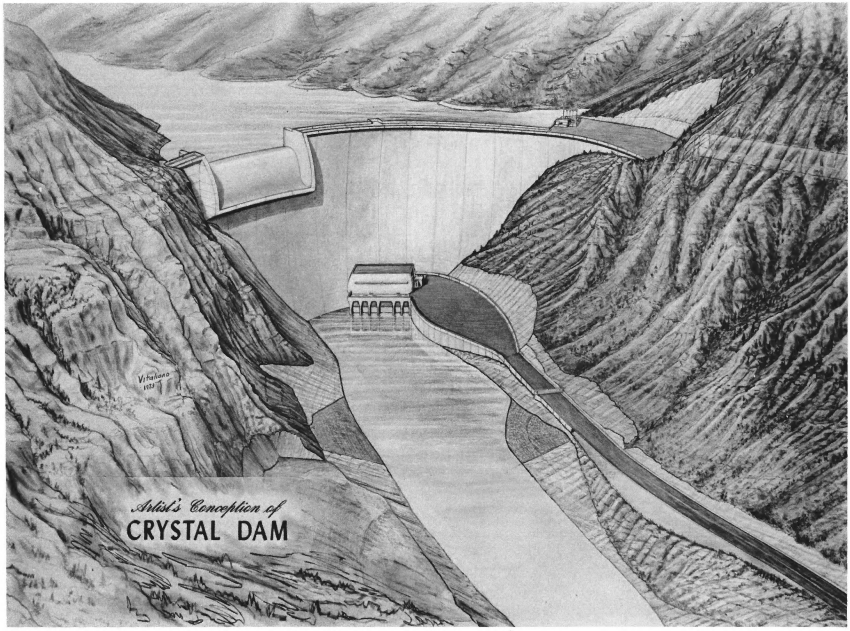
Distributed by Commissioner's Office, Washington, D.C.

- Advisory Council on Historic Preservation
- Department of Agriculture
- Department of Defense, Corps of Engineers
- Environmental Protection Agency
- Department of Interior
  - Bureau of Land Management
  - Bureau of Mines
  - Bureau of Outdoor Recreation
  - Bureau of Sport Fisheries and Wildlife
  - Geological Survey
  - National Park Service

Distributed by Upper Colorado Regional Office, Salt Lake City, Utah

- Regional Solicitor, Department of the Interior, Salt Lake City, Utah
- Environmental Protection Agency, Denver, Colorado
- Corps of Engineers, Sacramento, California
- Forest Service, Denver, Colorado
- Bureau of Land Management, Denver, Colorado
- Bureau of Mines, Denver, Colorado
- Bureau of Sport Fisheries and Wildlife, Salt Lake City, Utah
- U.S. Geological Survey, Denver, Colorado
- National Park Service, Omaha, Nebraska, and Montrose, Colorado
- Secretary's Field Representative, Missouri Basin Region, Denver, Colorado
- Governor, State of Colorado, Denver, Colorado
- Colorado Water Conservation Board, Denver, Colorado
- Colorado Department of Natural Resources, Denver, Colorado
- Colorado State Engineer, Denver, Colorado
- Colorado Division of Wildlife, Denver, Colorado
- Colorado State Planning Coordinator, Denver, Colorado
- Colorado State Historical Society, Denver, Colorado
- Colorado State University, Fort Collins, Colorado
- University of Colorado, Boulder, Colorado
- University of Denver, Denver, Colorado
- Ft. Lewis A & M College, Durango, Colorado
- University of Texas, Austin, Texas
- Ohio State University, Columbus, Ohio
- Rocky Mountain Chapter, Sierra Club, Boulder, Colorado
- Southwest Regional Representative, Sierra Club, Tucson, Arizona
- Southwest Field Representative, National Wildlife Federation Carmichael, California
- Colorado Plateau Environmental Advisory Council, Museum of Northern Arizona, Flagstaff, Arizona
- Colorado Wildlife Federation, Inc., Denver, Colorado
- National Wildlife Federation, Washington, D.C.
- Rocky Mountain Center on Environment, Denver, Colorado
- Colorado River Water Conservation District, Glenwood Springs, Colorado
- Upper Colorado River Commission, Salt Lake City, Utah
- Uncompahgre Valley Water Users Assoc., Montrose, Colorado
- Colorado River Board of California, Los Angeles, California
- Daily Press, Montrose, Colorado
- Daily Sentinel, Grand Junction, Colorado
- Denver Post, Denver, Colorado
- Rocky Mountain News, Denver, Colorado
- Delta County Independent, Delta, Colorado
- Courier, Gunnison, Colorado
- News-Champion, Gunnison, Colorado
- County Globe, Gunnison, Colorado
- Dravo Corporation, Belleview, Washington
- Marathon Oil Co., Littleton, Colorado
- L. G. Everist, Inc., Sioux Falls, South Dakota

TABLE OF CONTENTS


Artist's Conception of
CRYSTAL DAM

A. DESCRIPTION OF THE PROPOSAL

1. Introduction

The final environmental statement for the Crystal Dam, Reservoir, and Powerplant was filed with the Council on Environmental Quality on December 6, 1971. The statement evaluated the environmental impact from proposed construction of a double-curvature, thin-arch concrete dam and 28,000-kw hydroelectric powerplant on the Gunnison River about 15 miles east of Montrose, Colorado.

Since that time there have been changes from the preliminary design concepts and additional investigations and studies to lessen the environmental impact of the proposed construction which will be discussed in this supplement. An artist's concept of the dam and powerplant included at the front of this supplement indicates general details of the latest design for the features.

2. Status of Construction

A contract was awarded January 6, 1972, for construction of the diversion tunnel around the damsite and for drilling four foundation tunnels into the abutments. Work has progressed satisfactorily on this contract which was approximately 94 percent complete as of the end of January 1973.

A second contract was awarded September 1, 1972, for constructing the extension of the 115-kv Curecanti-Crystal transmission line from the top of the canyon down to a point just above the proposed dam crest. Most of this work will be performed using helicopters since additional access roads down the canyon wall were prohibited. Because of severe weather this work has been halted during the winter with only about 8 percent being completed earlier in the fall.

Invitations for the prime contract for construction of the dam and powerplant and a short realinement of the access road are currently scheduled to be issued in March 1973. Construction funds have also been included in the approved FY 1973 budget.

3. Changes Covered in Supplement

Further analysis of the operation of the Morrow Point Powerplant and the effect of a higher Crystal Reservoir on the Cimarron Creek delta where it enters the Gunnison River, indicated that it would be possible to raise the reservoir's normal water surface five feet above the original proposal. This also permits the option of various

combinations of raising the grade of the downstream channelization and increasing the power head.

Under the original proposal, most of the material to be processed for concrete aggregate would have been obtained from the downstream channel. The remainder would have been obtained upstream in the reservoir basin. Detailed examination of material sources located upstream from the damsite and in foundation excavation now indicates that more aggregate may be obtained from these locations. The channel grade is now proposed at an elevation 2.8 feet higher than the original design. This arrangement not only provides an additional 2.2 feet of power head, but reduces the length of downstream river channelization from 8,000 feet to 5,800 feet and cuts down on the time the contractor would be required to be in the river.

Based on hydraulic model studies of the dam and downstream area, the powerplant has been moved from the left abutment toward the center of the dam. This provided more desirable flow conditions in the tailrace and downstream channel and eliminates much of the disturbance to the canyon wall.

The last 500-foot reach of the access road to the top of the dam has been designed as a tunnel instead of open-cutting into a rocky ridge just downstream from the damsite.

The 115-kv transmission line extension from the canyon rim is being constructed using wood pole structures and is located in a draw upstream from the damsite. The line will not be visible from the public area below the dam. From the switchyard off the crest of the dam's left abutment, power cables will be carried underground to galleries inside the dam and down to the powerplant.

From the dam a second transmission line will be carried underground to provide power to the Crystal Field Station and Gunnison Tunnel caretaker's facilities.

Based on experience with the diversion tunnel contractor's wastewater treatment equipment and recent regulations of the Colorado Board of Health, both the capacity and performance capability of future equipment to be furnished will be increased.

B. DESCRIPTION OF THE ENVIRONMENT

Since changes to the proposed action covered in this supplement do not change the work area described in the final statement, this section is primarily concerned with additional information which has become available since filing of the final statement.

The photograph on the following page is an aerial view looking upstream at the Crystal Damsite taken before construction of the diversion tunnel.

CURECANTI UNIT--CRSP. LOOKING UPSTREAM ON GUNNISON RIVER AT CRYSTAL DAMSITE.
Bureau of Reclamation Photo P622C-427-4343 - May 21, 1971.

The actual damsite is near the center of the photograph near the point where the rocky ridge enters the river from the left side of the canyon wall.

1. Geology

Drilling of the diversion tunnel and four foundation tunnels has more clearly defined the formation and condition of the abutment rock which will support the structure. This permitted defining the extent of foundation excavation and concrete mass which will be required in final designs. Bureau of Reclamation geologists have concluded that foundation conditions are satisfactory for the proposed dam.

Further reconnaissance of the reservoir basin has revealed a large landslide area in the canyon wall of the upstream portion of the reservoir. It is located on the right side of the Gunnison River in sections 32 and 33, R6W, T49N, about 4½ miles upstream from the damsite. There is no surface evidence of recent activity. The landslide is outlined on U.S. Geological Survey Map I-584, "Geological Map of the Black Canyon of the Gunnison River and Vicinity, Western Colorado."

For those interested in more detail of the Black Canyon geology, reference is made to the United States Geological Survey Bulletin 1191, "The Black Canyon of the Gunnison, Today and Yesterday" by Wallace R. Hansen, 1965.

2. Seismicity

The Crystal Damsite is located in a moderately active region of mild earthquakes. The maximum historic earthquake in the vicinity of the site occurred in 1960 and had a magnitude of 5. The epicenter was estimated to be 15 miles south of the site and the focus was estimated to be 31 miles below the ground surface. In 1913 and 1962 magnitude 4 earthquakes were reported with their epicenters in the same vicinity as the 1960 earthquake. A magnitude 5 earthquake was recorded near Lake City, approximately 50 miles from the site, in 1955 and several shocks of maximum magnitude 4 occurred near Aspen, approximately 60 miles from the site, in 1960.

3. Vegetation

A description of the vegetation is contained in the National Park Service's brochure for visitors to the Black Canyon of the Gunnison National Monument. It is typical of the flora in the Crystal area and is quoted below.

> "The starkness of the canyon walls is emphasized by the abundant vegetation on the rim. Although most of the monument is

characterized by a cover of mountain brush, especially Gambel oak and serviceberry, there are several well-developed stands of pinon-juniper woodland in the higher sections. Douglas-fir and aspen grow in some parts of the canyon, where conditions are moister and cooler than those above it.

"Shrubs such as fendlerbush, wild rose, mockorange, rockspirea, snowberry, wax currant, gooseberry, and chokecherry are abundant. Various lichens and mosses grow on the rocks, and at least two species of ferns--oakfern and woodsia--have been found under damp overhangs."

During the preparation of design data for the three Curecanti reservoirs, a contract was negotiated with the Department of Anthropology of the University of Utah to perform a survey of the flora and fauna in the reservoir basins. This survey was performed during the summer of 1961 and the results have been summarized in two reports which give more detail on the vegetation as well as wildlife in the area. It should be noted that much of their effort was concentrated in the Blue Mesa area with examinations in the Crystal Reservoir area limited by its accessibility. The reports were written by Dr. Angus M. Woodbury and his associates and titled as follows:

"A Survey of Vegetation in the Curecanti Reservoir Basins," Anthropological Papers No. 56, June 1962

"Ecological Studies of the Flora and Fauna of the Curecanti Reservoir Basins, Western Colorado," Anthropological Papers No. 59, November 1962

4. Streamflows

The flow in the Gunnison River through the Crystal Reservoir basin is presently closely controlled by storages in and releases from Blue Mesa and Morrow Point Reservoirs. The major drainage entering the Gunnison below Morrow Point is Cimarron Creek which joins the main river just downstream from Morrow Point and into the future headwaters of Crystal Reservoir.

According to the latest published records (1970) of the U.S. Geological Survey, the average discharge in Cimarron Creek is about 88 cfs. Maximum recorded flood was 1,790 cfs measured in June 1957 with minimum flows of 8 cfs measured at several times during the period of record since 1954. These flows were measured at a gage approximately 12 miles south of Cimarron, Colorado, and do not reflect flood control effects on the river since the 1970 completion of Silver Jack Reservoir on its headwaters. The waters in Cimarron Creek are quite turbid, particularly during the spring runoff. There is a definite line of demarcation as the turbid flow from Cimarron joins the clearer water being released at Morrow Point.

Turbidity measurements have been taken by the Bureau of Reclamation along the Gunnison River in the vicinity of the Crystal damsite since April 1971. These will be used as a baseline upon which to judge the effectiveness of the contractor's water quality control measures when working in or adjacent to the river. Measurements have indicated an average turbidity ranging between 1 to 5 Jackson turbidity units during conditions of average flow. During the high spring runoff from Cimarron Creek turbidities will run up to 40 JTU with summer storms running up to 150 JTU. Observations have also been made during the performance of work in the river such as construction of earthfill dikes or excavation in the river channel. Samples taken when test excavation was done indicated that turbidity levels in the river 3,000 to 5,000 feet below the point of disturbance returned to the same JTU as above the disturbance.

5. Historical and Archeological Sites

Attached to this supplement is a copy of a February 28, 1973 letter from the Colorado State Historical Society indicating that they have no knowledge of any significant historical sites which will be affected by the proposed construction. An archeological survey of the reservoir area will be made by the University of Colorado in the summer of 1973 as indicated in Section D5.

C. ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

1. Stream Channelization

By reducing the length of channelizing from 8,000 to 5,800 feet, 2,200 feet of the present channel fishery will not be destroyed. Also the time the contractor will be required to work in the river channel and subject downstream reaches to turbid conditions will be reduced. The alinement of the channel has been established so as to preserve most of the natural conditions of the right bank of the river canyon. This bank will be the most obvious to visitors travelling to the dam because the access road is along the left bank.

Excavation for the channel will be one of the major causes of turbidity in the stream during construction. The channel section will have a 50-foot bottom width with 2 to 1 sideslopes. The bed of the present river is fairly well armored with boulders and cobbles, but excavation into the river gravels will release finer materials into the river which would be detrimental to the downstream fish habitat. Fine silts would fill in spawning gravels as well as interfering with feeding of very small fish.

2. Spillway Operation

Because of the proposed design and operation of the Crystal Dam spillway, concern has been expressed with the possibility of nitrogen supersaturation occurring in the spillway stilling basin when the water jet enters the deep pool. Spills will occur every two to three years when the reservoir water surface rises above the spillway crest. Supersaturation is thought to occur when the falling water

traps additional air and carries it below the surface of the pool under pressure. Unless there is considerable agitation and mixing in the pool, the air dissolves into the water which produces a nitrogen-rich condition that can be fatal to fish.

The Corps of Engineers has been conducting studies of this problem at some of their dams along the Columbia River. Their initial recommendation was that supersaturation levels above 110 percent would be lethal to fish. More recent results have given cause to question this standard.

During September 1972, personnel from the Bureau of Reclamation in cooperation with a representative from the Environmental Protection Agency's laboratory at Corvallis, Oregon, conducted nitrogen studies below Morrow Point Dam. In this case air was being injected into the generator turbines in an operation study, and nitrogen supersaturations up to 130 percent were measured in the tailrace. Observations of fish caught below the dam gave no indication of the gas bubble disease and there was no other evidence in the river of an anticipated fishkill.

2. Esthetics

The access road to the crest of the dam originally would have been cut into the side of the canyon and been exposed for its full length. The last 500 feet of the road has now been designed in tunnel section to avoid an extensive cut into a rock outcrop just downstream from the dam. By preserving the existing rock face, damage to the natural setting adjacent to the dam will be minimized.

Overhead power lines will only be visible to the public from the crest of the dam, from which point the 115-kv transmission line from the left abutment switchyard on up a draw in the side of the canyon may be viewed. There will be no overhead lines in front of the dam nor in the canyon immediately downstream.

4. Access Road

In order to improve safety on the existing access road into the canyon, it will be necessary to realine approximately 2,000 feet in two short reaches of roadway and relocate two sections of guardrail. This will disturb existing cut and embankment slopes along the present roadway which have stabilized since construction and which will be subject to erosion and ravelling until those slopes stabilize again.

5. Reservoir Bank Stability

Around Crystal Reservoir, it is likely that there will be localized slumping of reservoir banks as the toes of earth slopes are saturated

by rising waters. This is a standard occurrence where man-made bodies of water are created. Precautionary steps are difficult to prescribe since the incidence or total effect cannot be accurately predicted. Usually the effect is minimized as the slump scar and sloughed material are both covered by rising waters. This has been the experience at Morrow Point Reservoir which is located in similar terrain.

6. Recreation

As an indication of the recreational impact of current development in the Curecanti area, the following recent visitor statistics are quoted from the National Park Service. At the Curecanti National Recreation Area, there were 729,014 visitors between January and November 1972, a decrease of 2.5 percent from the same period in 1971. By comparison, the Black Canyon of the Gunnison National Monument reported 272,358 visitors for the same 1972 period, a 16.5 percent increase over 1971. It should be noted that there are no lodging facilities within the Monument. Limited overnight camping facilities are available on the south rim and have recently been provided at the less-frequented north rim.

The current status of National Park Service planning for recreation facilities on Crystal Reservoir is discussed in Section I.

7. Reservoir Inundation

The 5-foot higher reservoir will inundate 11 acres of canyon walls above the 287 acres submerged by the lower reservoir. This will extend the reservoir headwaters about 1,000 feet back to the junction of the Gunnison River with Curecanti Creek. If the reservoir remained at this higher level, there is the possibility that a sand bar would form as the flowing waters of Cimarron Creek entered the quieter waters of the reservoir. This could have a backwater effect on operations of the Morrow Point Powerplant.

Because of the fluctuating nature of the reservoir and as confirmed by hydraulic model studies, it is not predicted that this will occur. However, a minor amount of dredging work could be necessary to maintain the water surface differential between the two installations.

The upper end of the Crystal Reservoir (approximately 2,000 feet along the river channel) will be visible from the access road into Morrow Point Dam. This will be the area where the fluctuating water surface will be most obvious to the public. However, in this reach the reservoir will be largely confined within the present river banks with a maximum depth of 10 feet at the downstream end. Foot access into this reach of the river is extremely difficult.

8. Economics

It is estimated that the 2.2 feet of additional power head will add about 1,600,000 kwh of annual salable energy and 300 kw of salable capacity. Using presently agreed mill rate, this would mean an additional $9,300 in annual power revenues.

All other economic impacts as discussed in the final statement remain basically the same.

D. MITIGATING MEASURES AND AIR AND WATER QUALITY ASPECTS

Most of the changes discussed in this supplement are proposed to lessen the environmental impact of the construction.

1. Stream Channelization

The reduction in stream channelization will mean that approximately 2,200 linear feet of natural river channel will be preserved in its present condition instead of replacing it with a uniform artificial channel. The value of the fishery habitat for reproduction and growth in this reach is questionable because of the colder water which will be released from Crystal Reservoir. It is believed game fish will find their way into the reach and fisherman use will continue because it is one of the few accessible locations to river level in the Black Canyon of the Gunnison River.

Attempts will be made to maintain a natural appearance of the channelized reach by keeping disturbance of the right bank to a minimum, leaving the channel bottom in a roughened condition, and providing shallow areas and large boulders for cover and feeding. As indicated in the drawing at the front of this supplement, most of the apparent disturbance to the right bank will occur immediately below the dam where extra work must be performed to hydraulically disperse powerplant and river outlet releases. Recommendations from the Bureau of Sport Fisheries and Wildlife and State Division of Wildlife will be used in this special treatment.

A Federally-funded six-year study ($200,000) will be made of the Gunnison River below Crystal Dam by the Colorado Division of Wildlife to determine the effect of project construction and operation on the fishery. It is anticipated that the information obtained will benefit operations of the Curecanti reservoir system as well as be useful information for similar projects.

2. Spillway Operation

As indicated in Section C, the potential for nitrogen supersaturation in the river from spillway operation has been recognized and studies have been instigated to investigate its effect. Measurements in

stilling pools where there is considerable turbulence indicate that the nitrogen levels are much lower and within the 110 percent standard since the air bubbles have more opportunity for being forced out into the atmosphere before they are dissolved. This will occur at the higher discharge rates. Turbulence and riffles in the river channel downstream also tend to dissipate the excess nitrogen.

Based on experience at Morrow Point, there does not appear to be immediate cause for concern, but the situation will continue to be observed as operations commence at Crystal.

3. Esthetics

Placing the crest access road in a tunnel, preserving the right bank of the Gunnison River below the damsite, eliminating some overhead power lines, use of timber transmission line poles, concealing transmission line up a draw, and relocating the powerplant toward the center of the dam have all been proposed to minimize the visual impact of the man-made construction. Architectural lines of the concrete powerplant have been curved to blend into the lines of the thin-arch dam. Switchyard takeoff structures are also of concrete instead of the usual structural steel and are of the new low-profile design. An artist's conception of the dam and powerplant has been included at the front of this supplement.

4. Turbidity

The diversion tunnel contractor is presently using a Dorr-Oliver Clarifloculator to treat his wastewaters before their return to the river. This equipment has a capacity of 200 gpm with the capability of producing an effluent of not more than 30 Jackson turbidity units. Under the forthcoming specifications, the contractor will be required to furnish equivalent equipment with a capacity of 3,000 gpm. Effluent quality standards will be in accordance with the January 15, 1973, "Standards for the Discharge of Wastes" issued by the Water Pollution Control Commission of the Colorado Department of Health.

In order to minimize artificially-induced turbidity in the river, it was originally intended to restrict the contractor's operations within the river to the low water period between June and September each year. After further discussions with fish and game agencies this has been extended to permit operations within the river to between May and September for only two consecutive years. This would avoid the spawning and early growth period of rainbow trout in the spring and brown trout in the late fall. Close supervision will be required to keep required disturbance within the river to a minimum. Water quality controls already being used in the diversion tunnel contract plus others indicated in this supplement should be adequate to keep wastewater discharges into the river during the remainder of the year within prescribed State water quality standards.

5. Historical and Archeological Sites

A contract has been negotiated through the National Park Service with the Department of Anthropology at the University of Colorado to perform an archeological survey of the Crystal Reservoir basin to determine whether there are any sites of sufficient importance to warrant preservation or removal. This survey will be performed during the summer of 1973.

E. UNAVOIDABLE ADVERSE EFFECTS

The major change in the adverse effects listed in the final statement would be a 2,200-foot reduction in the length of trout stream habitat loss from stream channelization.

The esthetic impact from impingement of the man-made structures into the rugged canyon scenery was not mentioned in the final statement, but efforts to minimize that impact have been discussed in this supplement.

Slide slopes in the overburden which may be exposed above the reservoir water surface would be an esthetic detraction to boaters on the lake that would be difficult to restore because they usually expose less fertile subsoil and the steeper slopes do not encourage revegetation. The scars would be an unavoidable adverse effect because of the difficulty of predicting their occurrence.

F. SHORT- AND LONG-TERM ENVIRONMENTAL USES

The changes outlined in this supplement are in harmony with a long-term efficient utilization of the available hydraulic power head in this reach of the Gunnison River. The incremental increase of 2.2 feet of available head will result in additional power generation to improve project economics.

The short-term impacts will remain the same as discussed in the final statement.

G. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The irreversible and irretrievable commitments outlined in the final statement will remain essentially the same except for a minor change in magnitude. Additional river gravel will be required for the 5-foot higher concrete dam. Other construction materials used in the structures may also be considered as irretrievably committed and beyond complete salvage.

H. ALTERNATIVES TO PROPOSED ACTION

Changes to the proposed action as outlined in this supplement have not changed the basic proposal discussed in the final statement. Additional

analysis of the Morrow Point Powerplant operation and the hydraulic conditions at the junction of Cimarron Creek and Gunnison River has permitted a 5-foot higher operating water surface in Crystal Reservoir and a 2,200-foot decrease in the downstream river channelization.

During the past year additional funds have been committed to construction of the diversion tunnel and transmission line as well as other investigations which would have to be considered in comparing the original alternatives.

The alternatives for construction of the transmission line up the canyon wall have been analyzed and the decision made to use wood pole construction with overhead lines. The cost of a slant-drilled tunnel to conceal the line would have been prohibitive. An armored cable laid along the rocks would have been subject to damage from falling material and require almost constant maintenance.

The recommended design for the Crystal Dam and Powerplant represents a compromise between the various economic and environmental factors involved. Alternatives to the proposed action at this stage would consist of combinations of varying heights of the dam and the depth and extent of channelizing downstream.

A 5-foot lower dam and 8,000-foot long channelizing were discussed in the final environmental statement. Raising the grade of the downstream channelization the full 5 feet to match the increase in dam height would result in less excavation because of the 2.2-foot shallower depth. However, the overall length of the channelized river would remain approximately the same 5,800 feet because of an increased drop in streamgrade at the downstream end.

Another alternative would be to keep the channelized river at the same depth as in the final statement, but raise the dam as outlined in this supplement. This would mean an additional 2.8 feet of power head not available under the recommended plan, but would retain all the full impacts from the 8,000-foot long channelized river. By raising and shortening the channelization, the proposed plan would forego approximately $11,800 in annual power revenues that could be anticipated with the deeper channel.

I. CONSULTATION AND COORDINATION DURING DEVELOPMENT OF THE SUPPLEMENT

During the past year there has been continued informal contact with Federal and State wildlife agencies regarding proposals for mitigating damage to the river channel below Crystal Dam. On July 6, 1972, a field inspection was made of the affected reach of the river with personnel from the Colorado State Division of Wildlife (formerly Division of Game and Fish). At that time plans for maintaining or mitigating natural conditions in the river were discussed. Additional contacts will be made on this item. The proposed study of this reach of the river by the Division has been outlined in Section D.

In the final statement it was indicated that the National Park Service would be reevaluating the recreational plans for the Crystal feature, but final recommendations have not been made. That agency would prepare an environmental assessment of the visitor handling facilities on the lake and determine the future course of action with respect to the need for a formal statement. An assessment was jointly prepared by the Bureau of Reclamation and the National Park Service during the past year which resulted in a negative determination of environmental impact for the major administrative headquarters for the Curecanti National Recreation Area at Cimarron, Colorado. Crystal Reservoir is a part of the Recreation Area.

Since filing of the final environmental statement, two letters of comment on the statement have been received and are attached to this supplement.

In response to the February 28, 1973 letter from the State Historical Society of Colorado, a copy of the final environmental statement was originally sent to that organization on December 10, 1971, but was apparently lost or diverted enroute. A second copy has since been forwarded. A copy of the supplement to the final environmental statement will also be furnished for their information. The archeological survey by the University of Colorado is discussed in Section D5.

The response to comments dated March 13, 1972, by Dr. Hugo Ferchau of Western State College, Gunnison, Colorado, through the Rocky Mountain Center on Environment, is contained in the memorandum attached to this supplement.

510.—

CURECANTI COLORADO RIVER STORAGE

RECEIVED USBR DENVER FILE COPY

Date 22 200 305 150 110

Subs. Corresp. ____

Date Am'd. ____

cy 205
Pm Grd Jct
C.E., Montrose

THE STATE HISTORICAL SOCIETY OF COLORADO

Colorado State Museum, 200 Fourteenth Avenue, Denver 80203

February 28, 1973

Mr. Robert Brewster
United States Department of the Interior
Regional Office - Region 4
Post Office Box 11568
Salt Lake City, Utah 84111

RE Project: Draft Environmental Statement
Crystal Dam Reservoir and Powerplant
Curecanti Unit
Colorado River Storage Project

Dear Mr. Brewster:

The State Historical Society knows of no significant historic sites or structures which will be affected by the work proposed under the above referenced project. It is our understanding, however, pursuant to our telephone conversation, that the University of Colorado has or will be contracted regarding an archaeological survey within the limits of the project area.

Mentioned in your letter of November 3, 1971 (Gilbert to Marshall) is a comment regarding the preparation of the final environmental statement which was never received. Would you please forward a copy of this to the State Historical Society to complete our records.

Sincerely,

James Edward Hartmann

James Edward Hartmann
Curator, Buildings and Sites

0699

ROCKY MOUNTAIN CENTER ON ENVIRONMENT
4260 East Evans Avenue · Denver, Colorado 80222 · 303/757-9808

ROMCOE

March 13, 1972

Mr. Leroy Z. Holmes
Region 4 Director
Bureau of Reclamation
P.O. Box 11568
Salt Lake City, Utah 84111

Dear Mr. Holmes:

Enclosed for your information are the comments of Dr. Hugo Ferchau of Western State College concerning the Crystal Dam environmental impact statement. It is unfortunate that we are so late in sending the review, but we hope that his observations will be of assistance to you.

Any comments that you have regarding his review would be appreciated.

Sincerely,

ROCKY MOUNTAIN CENTER ON ENVIRONMENT

Debbie Milner

Ms. Debbie Milner
Research Assistant

0699

FORUMS • CLEARING HOUSE • ENVIRONMENTAL INVESTIGATIONS • PLANNING • COMMUNICATIONS

Western State College of Colorado

Gunnison, Colorado
81230

DIVISION OF NATURAL SCIENCES AND MATHEMATICS

February 24, 1972

CRITIQUE OF FINAL ENVIRONMENTAL STATEMENT OF CRYSTAL DAM DEVELOPMENT

pg. 2 IIA Some inconsistency as to where the dam will be, with respect to Montrose.

pg. 2 IIB Minor point. Temperature refers to a unit of measurement and therefore temperature cannot be pleasant or hot or cold.

Pg. 3 IIC Since Hansen has worked out the geology of the Black Canyon in detail, and has published same, it should be cited for information to a reader who is not well acquainted with the area. Reference is made to the availability of detailed reports, but no indication as to what these detailed reports are, nor where they may be obtained.

pg. 3 IID The Vegetation section is completely inadequate. Beidleman has worked up the vegetation of the Black Canyon. Reference to his report would provide the reader with a clear concept of the vegetation. Although I cannot cite the species, I have been told by botanist friends who have collected the area more intensively than I that the flora is quite unique.

pg. 4 IIE I don't know what "very little fisherman use" means. Everytime I have been in the canyon, there have been fishermen there. It is the favorite spot of many of my students----those who are aware of it. It is my impression that a rather unusual rattlesnake and unusual amphibians are in the valley bottom.

pg. 4 IIG Reference is made to Black Canyon National Monument. No statement is made as to specifically how the monument will be affected. Will the dam be visible from the monument? Since the road leading to the monument is narrow and winding, and the servicing of the dam construction will be over the same road, it would be anticipated the driving will be more hazardous. No statement as to how it will be made less hazardous or how the road will be maintained as it receives the beating of heavy equipment.

pg. 5 IIIA No provision is made for interpreting economic significance of electrical power output. The impression I have received is that the value of electrical power is 6-7 mills per KWH at the damsite. The cost of producing power is 3-4 mills. Therefore, $474,000 will be derived annually from increased power production, if high levels of production are maintained. How does this compare with the cost of the dam complex and its life expectancy?

pg. 7 IIIB2a Through what stratum will the diversion tunnel run? How wide is the valley where the tunnel spoil will be placed? Will it increase turbidity and to what degree? What are the options available to the contractor for obtaining aggregates? What possible impacts? No power available at the bottom of the canyon? At a later point it is stated that transmission lines are available at the rim.

Western State College of Colorado

Gunnison, Colorado

81230

DIVISION OF NATURAL SCIENCES AND MATHEMATICS

pg 8 III B2b Second complete paragraph, last sentence. I do not see the logic of the senten ce.

pg 8 III B2b Third complete paragraph. At this point and at other points, statements are made about dumping waste on the reservoir floor. How much will the floor of the reservoir be raised? How will this change the quality of the floor, as it may affect organisms?

pg 9 III B2d At this point one of the major weaknesses of the entire project is brought out, but with minimal emphasis. I question the stability of the access road into the bottom of the canyon, and after reading the statement, I see nothing which provides information which makes me wish to retract the question. I am concerned about the ability of the road to carry the amount of heavy equipment which will be run over it and I wonder about its ability to resist erosion. Considering there are no alternate accesses for the future, I feel the demonstration of stability is a necessity.

pg 9 III B2d Since the disposition of the field station is undetermined, some statement regarding alternatives should be made. It might well be worthwhile to indicate what definitely will not be done with it. If there is a possibility it will remain where it is, some statement should be made of architectural quality.

pg 10 III C Third complete paragraph. Reference is made to attached paragraphs, which are written in an extremely general manner. No specifics are included as to how these statements are going to be applied to this particular project.

pg 17 IV D Last sentence of the page. Does the Bureau have any statistics to demonstrate that the basin can environmentally tolerate much more growth? All of the evidence I can piece together is that there should be little more growth.

Memo to files April 18, 1973

Subject: Response to comments from Rocky Mountain Center on Environment on the Crystal Dam Final Environmental Statement (INT FES 71-21)

pg. 2 IIA The two referenced distances are not inconsistent in that the first is a straight line measurement and the second indicates "road miles."

pg. 2 IIB Perhaps "climate" would have been a more accurate word but the term used should have been clear to most reviewers of the statement.

pg. 3 IIC Hansen's report is an excellent summary of Black Canyon geology written in laymen's language and has been included in Section B1. of the supplement. The most recent geological reports which have been made available include "Preconstruction Geology Report on Crystal Dam" dated January 1973 and "Records of Subsurface Investigations and Construction of Foundation Material Test Data For Crystal Dam and Powerplant" dated March 1973. Copies of these reports may be examined at the Bureau of Reclamation offices in Denver, Colorado, Salt Lake City, Utah, and Montrose, Colorado.

pg. 3 IID Additional data on the vegetation has been included in Section B3. of the supplement. Although Beidleman's report could not be located, the results of a survey by the Department of Anthropology at the University of Utah of flora and fauna in the Curecanti reservoir areas have been referenced in the supplement. We cannot substantiate Dr. Ferchau's inference that the flora in the Crystal Reservoir area is unique.

pg. 4 IIE The term "very little" is relative when compared with fisherman use of other more accessible reaches of the river. The only vehicular access to the river is over the access road to the proposed damsite. Those hiking to the river from the canyon rim report a 6-hour total hiking time to the bottom of the canyon. This restricts use to the most avid fisherman. A review of the University of Utah reports referred to in Section B3. does not document any of the"rather unusual rattlesnake and unusual amphibians" referred to by Dr. Ferchau.

pg. 4 IIG Additional discussion has been included in the supplement on the impact on the National Monument from construction of Crystal Dam. The Dam will not be visible from any point in the Monument. Only a short reach of the access road to the damsite will be visible from a couple of viewpoints along the eastern end of the Monument. Section C4. of the supplement indicates revisions to the access road to improve safety conditions. In addition, the specifications for the dam now also require providing plant-mix bituminous surfacing on the entire access road.

pg. 5 IIIA Economic aspects of the proposed action are discussed in detail in the "Economic Justification Report, April 1962 - A Supplement to the Economic Justification Report of February 1959" which was prepared by the Bureau of Reclamation and submitted to the Secretary of the Interior. It served as the basis for his March 4, 1963 certification that the Crystal feature should be included with the Curecanti Unit. This economic analysis indicated the benefit-cost ratio for the Crystal feature of 1.29 to 1 and was based on a 100-year life for the facilities.

pg. 7 IIIB2a The geological reports referenced above indicate the formation through which the diversion tunnel was drilled. Section B4. of the supplement discusses turbidity measurements which have been made during construction of the diversion tunnel. Section A3. of the supplement explains the options available to the contractor for obtaining aggregates and the anticipated impacts. The final statement indicated that no power was available at the bottom of the canyon and the diversion tunnel contractor has been using portable generators. Section A3. of the supplement discusses construction of the transmission line from the canyon rim to the crest of the dam.

pg. 8 IIIB2b Had there been a greater area in the bottom of the canyon for aggregate stockpiles, theoretically the contractor would have been able to concentrate his aggregate processing into one continuous operating period. With limited area, the processing must be scheduled coincidental with concrete production so that no significant stockpiles would be built up. The schedule would also minimize contractor-induced turbidity in the river as discussed in Section D4. of the supplement.

pg. 8 IIIB2b Specifications for the dam direct disposal of waste material on the side of the canyon with a 30-foot-wide river channel being maintained. This means the floor of the reservoir would not be raised. The top of the waste piles would be below minimum operating water surface in the reservoir. The alternative to upstream disposal sites would be the far less esthetically acceptable downstream sites or the considerable expense of removing the material from the canyon.

pg. 9 IIIB2d The present access road to the bottom of the canyon is an improvement and realinement of the old access road to the Gunnison Tunnel inlet which had been in service for more than 60 years. Maintenance of the road has been a continuing problem. Experience gained in the past year with the diversion tunnel contractor has resulted in safety changes which are included in the forthcoming prime contract and are discussed in Section C4. of the supplement.

pg. 9 IIIB2d Final disposition of the field station has still not been determined. The station consists of a laboratory and field office, two garages, and a small pumphouse. All buildings are of prefabricated metal design with a painted rather than

a galvanized finish. All of these buildings would not be retained at the site if the decision is made to retain some of the facilities.

pg. 10 IIIC Specification paragraphs inserted in the final statement were only given as typical examples. Specifications No. DC-7000 for construction of Crystal Dam and Powerplant which has recently been issued includes essentially the same paragraphs which have been modified to make them adaptable to the specific work.

pg. 17 IVD The economic growth which would be facilitated by construction of the Crystal Unit would be its incremental contribution as a run-of-the-river generating unit to help finance the development of various participating irrigation projects in the Upper Colorado Basin. Recent trends have indicated a conversion in these project purposes to providing more municipal and industrial water. Crystal Dam will have little effect on regulation of water for municipal and industrial use. Its primary function is as an afterbay and power generating facility. Regardless of the ultimate utilization of the Colorado Compact-allocated waters in the Upper Basin, the principal of obtaining financial assistance from Colorado River Storage Project power revenues would remain the same. The distribution, magnitude, and types of growth permitted would remain the responsibility of the various states. Conflicting opinions on the extent of this growth would be factors in their determination.